WE CLAIM:

1. An interferometer comprising:

a first port for launching an input beam of light;

a beamsplitter for splitting the input beam of light into first and second sub-beams, and for directing the first and second sub-beams along first and second optical paths, respectively;

tuning plate means positioned in the first optical path;

a first reflective surface positioned in the first optical path at a desired distance defining a first optical path length, the first reflective surface for redirecting at least a portion of the first sub-beam for interference with the second sub-beam;

fixed plate means positioned in the second optical path;

a second reflective surface positioned in the second optical path at a desired distance defining a second optical path length, the second reflective surface for redirecting at least a portion of the second sub-beam for interference with the first sub-beam forming first and second output beams;

a second port for outputting the first output beam; and

a third port for outputting the second output beam;

wherein the tuning plate means is oriented so that the fixed plate means and the tuning plate means provide a desired optical path length difference between the first and second optical path lengths.

2. The interferometer according to claim 1, wherein the first and second sub-beams pass through an unequal amount of solid material in the beamsplitter creating an optical path mismatch; and wherein the tuning plate means and the fixed plate means are oriented to compensate for the optical path mismatch.

3. The interferometer according to claim 2, wherein the tuning plate means and the fixed plate means are comprised of a material with an index of refraction greater than that of the beamsplitter, thereby enabling the tuning plate means and the fixed plate means to be thin enough, whereby thermal expansion of the tuning plate means and the fixed plate means has no substantial effect on the optical path length difference.

4. The interferometer according to claim 1, wherein the first reflective surface is separated from the beamsplitter by spacer means that thermally expand by substantially the same amount as the tuning plate means, whereby, including expansion of the fixed plate means, the optical path length

difference does not substantially change over a practical range of temperatures; and wherein said spacer means defines a gap within which the tuning plate means is positioned.

5. The interferometer according to claim 4, wherein each spacer means is comprised of a first component having a thickness and a coefficient of thermal expansion selected to match the thermal expansion of the tuning plate means, and a second component having a relatively low coefficient of thermal expansion selected to provide substantially no thermal expansion.

6. The interferometer according to claim 5, wherein the first component has substantially the same thickness and substantially the same coefficient of thermal expansion as the tuning plate means.

7. The interferometer according to claim 6, wherein the tuning plate means and the fixed plate means are constructed from substantially the same material and have substantially the same thickness between respective, parallel, front and back faces; and wherein the tuning plate is oriented to receive the first sub-beam at a non-normal angle to the front face.

8. The interferometer according to claim 4, wherein the tuning plate means comprises a first tuning plate and a second tuning plate, wherein the second tuning plate has a different refractive index than the first tuning plate.

9. The interferometer according to claim 8, wherein the fixed plate means comprises a first fixed plate and a second fixed plate; wherein the first fixed plate has substantially the same refractive index as the first tuning plate, and the second fixed plate has substantially the same refractive index as the second tuning plate.

10. The interferometer according to claim 8, wherein each spacer means is comprised of a first component having a thickness and a coefficient of thermal expansion selected to substantially match the thermal expansion of the first tuning plate; a second component having a thickness and a coefficient of thermal expansion selected to substantially match the thermal expansion of the second tuning plate; and a third component having a relatively low coefficient of thermal expansion selected to ensure substantially no thermal expansion thereof.

11. The interferometer according to claim 4, further comprising a mounting plate optically coupled to the beamsplitter in the first optical path, whereby the spacer means extend therefrom; wherein the fixed plate means has a thickness and a coefficient of thermal expansion selected to substantially match the combined expansion of the tuning plate means and the mounting plate to ensure the optical path length difference remains constant over a practical range of temperatures.

12. The interferometer according to claim 1, wherein at least one of the first reflective surface and the second reflective surface is a front reflective surface of a resonator.

13. An interferometer comprising:

a first port for launching an input beam of light;

a beamsplitter comprising first and second transparent blocks with a partially reflective surface therebetween, for splitting the input beam of light into first and second sub-beams, and for directing the first and second sub-beams along first and second optical paths through the first and second transparent blocks, respectively, said first and second sub-beams traveling through an unequal amount of solid transparent block causing an optical path mismatch;

a first reflective surface positioned in the first optical path at a desired distance from the separation point defining a first optical path length, the first reflective surface for redirecting at least a portion of the first sub-beam for interference with the second sub-beam;

spacer means defining a gap between the first transparent block and the first reflective surface;

tuning plate means positioned in the first optical path within the gap;

a second reflective surface positioned in the second optical path at a desired distance from the separation point defining a second optical path length, the second reflective surface for redirecting at least a portion of the second sub-beam for interference with the first sub-beam forming first and second output beams;

fixed plate means positioned in the second optical path between the second transparent block and the second reflective surface;

a second port for outputting the first output beam; and

a third port for outputting the second output beam;

wherein the tuning plate means is oriented so that the fixed plate means and the tuning plate means compensate for the optical path mismatch; and

wherein thermal expansion of the spacer means compensates for thermal expansion of the tuning plate means, which along with thermal expansion of the fixed plate means ensure that a desired optical path length difference between the first and second optical path lengths does not change over a practical range of temperatures.

14. The interferometer according to claim 13, wherein the tuning plate means comprises a first tuning plate and a second tuning plate, wherein the first tuning plate has a refractive index different than that of the second tuning plate.

15. The interferometer according to claim 14, wherein the fixed plate means comprises a first fixed plate and a second fixed plate; and wherein the first fixed plate is constructed out of substantially the same material as the first tuning plate, and the second fixed plate is constructed out of substantially the same material as the second tuning plate.

16. The interferometer according to claim 15, wherein each spacer means is comprised of a first component constructed out of substantially the same material as the first tuning plate; a second component constructed out of substantially the same material as the second tuning plate; and a third component having a relatively low coefficient of thermal expansion selected to ensure substantially no thermal expansion thereof.

17. The interferometer according to claim 13, further comprising a mounting plate optically coupled to the beamsplitter in the first optical path, whereby the spacer means extend therefrom; wherein each spacer means is comprised of a first component constructed out of the substantially the same material as the first tuning plate, and a second component having a relatively low coefficient of thermal expansion selected to ensure substantially no thermal expansion thereof; and wherein the fixed plate means and the mounting plate are constructed out of substantially the same material as the tuning plate means.

18. A device for maintaining a constant air gap between two surfaces comprising:

tuning plate means disposed between the two surfaces for adjusting the optical path length between the two surfaces; and

spacer means extending between the two surfaces, which thermally expand to compensate for thermal expansion of the tuning plate means.

19. The device according to 18, wherein each spacer means is comprised of a first component having a thickness and a coefficient of thermal expansion selected to match the thermal expansion of the tuning plate means; and a second component having a relatively low coefficient of thermal expansion selected to ensure substantially no thermal expansion thereof.

20. The device according to claim 18, wherein the tuning plate means comprises a first tuning plate and a second tuning plate; wherein the second tuning plate has a different refractive index than the first tuning plate; and wherein each spacer means is comprised of a first component having a thickness and a coefficient of thermal expansion selected to match the thermal expansion of the first tuning plate, a second component having a thickness and a coefficient of thermal expansion selected to match the thermal expansion of the second tuning plate, and a third component having relatively low coefficient of thermal expansion selected to ensure substantially no thermal expansion.

21. The device according to claim 19, wherein said spacer means comprises a first and a second spacer; and wherein the first component of the first spacer is thicker than the first component of the second spacer, whereby a change in temperature tilts one of the surfaces relative to the other.